

## Description

The Advanced Ultra Low Power (AUP) CMOS logic family is designed for low power and extended battery life in portable applications.

The AUP1G14 is a single 1-input Schmitt-trigger inverter gate with a standard push-pull output designed for operation over a power supply range of 0.8V to 3.6V. The device is fully specified for partial power down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

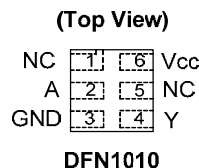
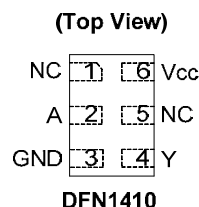
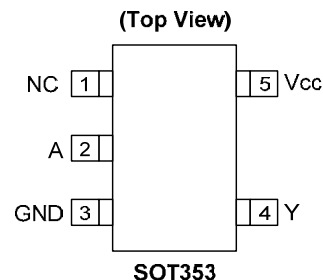
$$Y = \overline{A}$$

## Features

- Advanced Ultra Low Power (AUP) CMOS
- Supply Voltage Range from 0.8V to 3.6V
- $\pm 4\text{mA}$  Output Drive at 3.0V
- Low Static power consumption
  - $I_{CC} < 0.9\mu\text{A}$
- Low Dynamic Power Consumption
  - $C_{PD} = 6.2\text{pF}$  (Typical at 3.6V)
- Schmitt Trigger Action at All Inputs Make the Circuit Tolerant for Slower Input Rise and Fall Time. The hysteresis is typically 250mV at  $V_{CC} = 3.0\text{V}$
- $I_{OFF}$  Supports Partial-Power-Down Mode Operation
- ESD Protection Exceeds JESD 22
  - 2000-V Human Body Model (A114-A)
  - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options SOT353, DFN1410, and DFN1010
- Leadless packages per JESD30E
  - DFN1010 denoted as X2-DFN1010-6
  - DFN1014 denoted as X2-DFN1014-6
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.  
 2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.  
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Assignments



## Applications

- Suited for battery and low power needs
- Wide array of products such as:
  - Tablets, E-readers
  - Cell Phones, Personal Navigation / GPS
  - MP3 players, Cameras, Video Recorders
  - PCs ultrabooks, notebooks, netbooks,
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box

[Click here for ordering information, located at the end of datasheet](#)

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**Pin Descriptions**

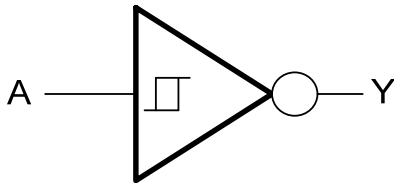
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Pin Name	Function
NC	No Connection
A	Data Input
GND	Ground
Y	Data Output
Vcc	Supply Voltage

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**Logic Diagram**

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**Function Table**

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Inputs	Output
A	Y
H	L
L	H

### Absolute Maximum Ratings (Note 4) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	KV
ESD CDM	Charged Device Model ESD Protection	1	KV
V <sub>CC</sub>	Supply Voltage Range	-0.5 to +4.6	V
V <sub>I</sub>	Input Voltage Range	-0.5 to +4.6	V
V <sub>O</sub>	Voltage applied to output in high or low state	-0.5 to V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> < 0	50	mA
I <sub>OK</sub>	Output Clamp Current (V <sub>O</sub> < 0)	50	mA
I <sub>O</sub>	Continuous Output Current (V <sub>O</sub> = 0 to V <sub>CC</sub> )	±20	mA
I <sub>CC</sub>	Continuous Current Through V <sub>CC</sub>	50	mA
I <sub>GND</sub>	Continuous Current Through GND	-50	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>STG</sub>	Storage Temperature	-65 to 1+50	°C

Note: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

### Recommended Operating Conditions (Note 5) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Min	Max	Unit	
V <sub>CC</sub>	Operating Voltage	0.8	3.6	V	
V <sub>I</sub>	Input Voltage	0	3.6	V	
V <sub>O</sub>	Output Voltage	0	V <sub>CC</sub>	V	
I <sub>OH</sub>	High-Level Output Current	V <sub>CC</sub> = 0.8V		-20	μA
		V <sub>CC</sub> = 1.1V		-1.1	mA
		V <sub>CC</sub> = 1.4V		-1.7	
		V <sub>CC</sub> = 1.65V		-1.9	
		V <sub>CC</sub> = 2.3V		-3.1	
		V <sub>CC</sub> = 3.0V		-4	
I <sub>OL</sub>	Low-Level Output Current	V <sub>CC</sub> = 0.8V		20	uA
		V <sub>CC</sub> = 1.1V		1.1	mA
		V <sub>CC</sub> = 1.4V		1.7	
		V <sub>CC</sub> = 1.65V		1.9	
		V <sub>CC</sub> = 2.3V		3.1	
		V <sub>CC</sub> = 3.0V		4	
T <sub>A</sub>	Operating Free-Air Temperature	-40	125	°C	

Note: 5. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Unit
				Min	Max	Min	Max	
V <sub>T+</sub>	Positive-going input threshold voltage		0.8V	0.4	0.65	0.4	0.65	V
			1.1V	0.53	0.9	0.53	0.9	
			1.4V	0.74	1.11	0.74	1.11	
			1.65V	0.91	1.29	0.91	1.29	
			2.3V	1.37	1.77	1.37	1.77	
V <sub>T-</sub>	Negative-going input threshold voltage		0.8V	0.15	0.4	0.15	0.4	V
			1.1V	0.26	0.65	0.26	0.65	
			1.4V	0.39	0.75	0.39	0.75	
			1.65V	0.47	0.84	0.47	0.84	
			2.3V	0.69	1.04	0.69	1.04	
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )		0.8V	0.07	0.5	0.07	0.5	V
			1.1V	0.08	0.46	0.08	0.46	
			1.4V	0.18	0.56	0.18	0.56	
			1.65V	0.27	0.66	0.27	0.66	
			2.3V	0.53	0.92	0.53	0.92	
V <sub>OH</sub>	High-Level Output Voltage	I <sub>OH</sub> = -20μA	0.8V to 3.6 V	V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1		V
		I <sub>OH</sub> = -1.1mA	1.1V	0.75 X V <sub>CC</sub>		0.7 X V <sub>CC</sub>		
		I <sub>OH</sub> = -1.7mA	1.4V	1.11		1.03		
		I <sub>OH</sub> = -1.9mA	1.65V	1.32		1.30		
		I <sub>OH</sub> = -2.3mA	2.3V	2.05		1.97		
		I <sub>OH</sub> = -3.1mA		1.9		1.85		
		I <sub>OH</sub> = -2.7mA	3V	2.72		2.67		
I <sub>OH</sub> = -4mA	2.6			2.55				
V <sub>OL</sub>	High-Level Input Voltage	I <sub>OL</sub> = 20μA	0.8V to 3.6V		0.1		0.1	V
		I <sub>OL</sub> = 1.1mA	1.1V		0.3 X V <sub>CC</sub>		0.3 X V <sub>CC</sub>	
		I <sub>OL</sub> = 1.7mA	1.4V		0.31		0.37	
		I <sub>OL</sub> = 1.9mA	1.65V		0.31		0.35	
		I <sub>OL</sub> = 2.3mA	2.3V		0.31		0.33	
		I <sub>OL</sub> = 3.1mA			0.44		0.45	
		I <sub>OL</sub> = 2.7mA	3V		0.31		0.33	
I <sub>OL</sub> = 4 mA		0.44			0.45			
I <sub>I</sub>	Input Current	V <sub>I</sub> = GND to 3.6V	0V to 3.6V		± 0.1		± 0.5	μA
I <sub>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0		± 0.2		0.6	μA
ΔI <sub>OFF</sub>	Delta Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0V to 0.2V		± 0.2		0.6	μA
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0	0.8V to 3.6V		0.5		0.9	μA
ΔI <sub>CC</sub>	Additional Supply Current	Input at V <sub>CC</sub> -0.6V	3.3V		40		50	μA

**Electrical Characteristics** (cont.) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	T <sub>A</sub> = -40 to 125 °C		Unit
				Min	Max	
V <sub>T+</sub>	Positive-going input threshold voltage		0.8V	0.4	0.65	V
			1.1V	0.53	0.9	
			1.4V	0.74	1.11	
			1.65V	0.91	1.29	
			2.3V	1.37	1.77	
			3.0V	1.61	2.32	
V <sub>T-</sub>	Negative-going input threshold voltage		0.8V	0.15	0.4	V
			1.1V	0.26	0.65	
			1.4V	0.39	0.75	
			1.65V	0.47	0.84	
			2.3V	0.69	1.04	
			3.0V	0.88	1.24	
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )		0.8V	0.07	0.5	V
			1.1V	0.08	0.46	
			1.4V	0.18	0.56	
			1.65V	0.27	0.66	
			2.3V	0.53	0.92	
			3.0V	0.79	1.31	
V <sub>OH</sub>	High-Level Output Voltage	I <sub>OH</sub> = -20μA	0.8V to 3.6V	V <sub>CC</sub> - 0.11	V	
		I <sub>OH</sub> = -1.1mA	1.1V	0.6 X V <sub>CC</sub>		
		I <sub>OH</sub> = -1.7mA	1.4V	0.93		
		I <sub>OH</sub> = -1.9mA	1.65V	1.17		
		I <sub>OH</sub> = -2.3mA	2.3V	1.77		
		I <sub>OH</sub> = -3.1mA		1.67		
		I <sub>OH</sub> = -2.7mA	3V	2.40		
		I <sub>OH</sub> = -4mA		2.30		
V <sub>OL</sub>	High-Level Input Voltage	I <sub>OL</sub> = 20μA	0.8V to 3.6V	0.11	V	
		I <sub>OL</sub> = 1.1mA	1.1V	0.33 X V <sub>CC</sub>		
		I <sub>OL</sub> = 1.7mA	1.4V	0.41		
		I <sub>OL</sub> = 1.9mA	1.65V	0.39		
		I <sub>OL</sub> = 2.3mA	2.3V	0.36		
		I <sub>OL</sub> = 3.1mA		0.50		
		I <sub>OL</sub> = 2.7mA	3V	0.36		
		I <sub>OL</sub> = 4mA		0.50		
I <sub>I</sub>	Input Current	V <sub>I</sub> = GND to 3.6V	0V to 3.6V	± 0.75	μA	
I <sub>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0	± 3.5	μA	
ΔI <sub>OFF</sub>	Delta Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0V to 0.2V	± 2.5	μA	
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0	0.8V to 3.6V	3.0	μA	
ΔI <sub>CC</sub>	Additional Supply Current	Input at V <sub>CC</sub> -0.6V	3.3V	75	μA	

## Switching Characteristics

 $C_L=5\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>CC</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A or B	Y	0.8V		19.9						ns
			1.2V ± 0.1V	2.0	8.5	12.0	2.0	13.1	2.0	13.1	
			1.5V ± 0.1V	1.5	4.3	6.6	1.5	7.1	1.5	7.4	
			1.8V ± 0.15V	1.2	3.7	5.4	1.2	6.0	1.2	6.2	
			2.5V ± 0.2V	1.0	3.0	4.1	1.0	4.5	1.0	4.7	
			3.3V ± 0.3V	0.8	2.8	3.6	0.8	3.9	0.8	4.0	

 $C_L=10\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>CC</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A or B	Y	0.8V		23.4						ns
			1.2V ± 0.1V	2.5	8.7	13.7	2.5	13.8	2.5	13.9	
			1.5V ± 0.1V	2.0	5.0	7.7	2.0	8.2	2.0	8.6	
			1.8V ± 0.15V	1.7	4.2	6.2	1.7	6.7	1.7	7.1	
			2.5V ± 0.2V	1.4	3.6	4.8	1.4	5.2	1.4	5.5	
			3.3V ± 0.3V	1.2	3.3	4.3	1.2	4.5	1.2	4.7	

 $C_L=15\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>CC</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A or B	Y	0.8V		26.9						ns
			1.2V ± 0.1V	2.9	9.2	15.3	2.9	17	2.9	17	
			1.5V ± 0.1V	2.3	5.5	8.6	2.3	9.4	2.3	9.8	
			1.8V ± 0.15V	2.1	4.7	7	2.1	7.7	2.1	8.1	
			2.5V ± 0.2V	1.7	4	5.5	1.7	5.9	1.7	6.2	
			3.3V ± 0.3V	1.5	3.8	4.8	1.5	5.2	1.5	5.4	

 $C_L=30\text{pF}$  see Figure 1

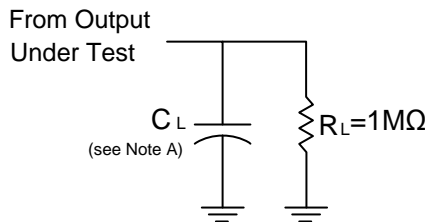
Parameter	From Input	TO OUTPUT	V <sub>CC</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A or B	Y	0.8V		37.3						ns
			1.2V ± 0.1V	3.9	11.2	20.7	3.9	22.5	3.9	22.5	
			1.5V ± 0.1V	3.2	7.1	11.2	3.2	12.3	3.2	12.9	
			1.8V ± 0.15V	2.9	6.0	9.1	2.9	10.0	2.9	10.6	
			2.5V ± 0.2V	2.5	5.2	6.9	2.5	7.5	2.5	7.9	
			3.3V ± 0.3V	2.3	4.8	6.1	2.3	7.1	2.3	7.4	

**Operating and Package Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

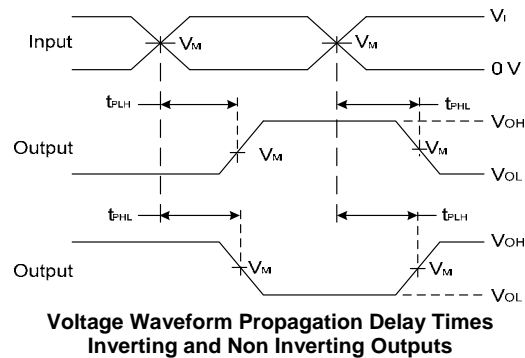
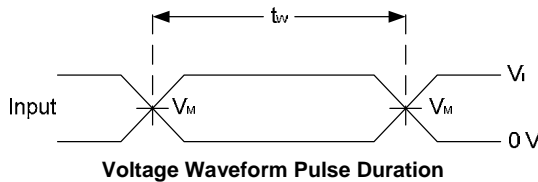
Parameter		Test Conditions	V <sub>CC</sub>	Typ	Unit	
C <sub>pd</sub>	Power Dissipation Capacitance	f = 1MHz No Load	0.8V	6.5	pF	
			1.2V ± 0.1V	6.5		
			1.5V ± 0.1V	6.4		
			1.8V ± 0.15V	6.4		
			2.5V ± 0.2V	6.3		
			3.3V ± 0.3V	6.3		
C <sub>i</sub>	Input Capacitance	V <sub>i</sub> = V <sub>CC</sub> or GND	0V or 3.3V	1.5	pF	
θ <sub>JA</sub>	Thermal Resistance Junction-to-Ambient	SOT353	(Note 6)		371	°C/W
		X2-DFN1410-6		430		
		X2-DFN1010-6		445		
θ <sub>JC</sub>	Thermal Resistance Junction-to-Case	SOT353	(Note 6)		143	°C/W
		X2-DFN1410-6		190		
		X2-DFN1010-6		250		

Notes: 6. Test condition for SOT353, X2-DFN1410-6, and X2-DFN1010-6 devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

**Parameter Measurement Information**



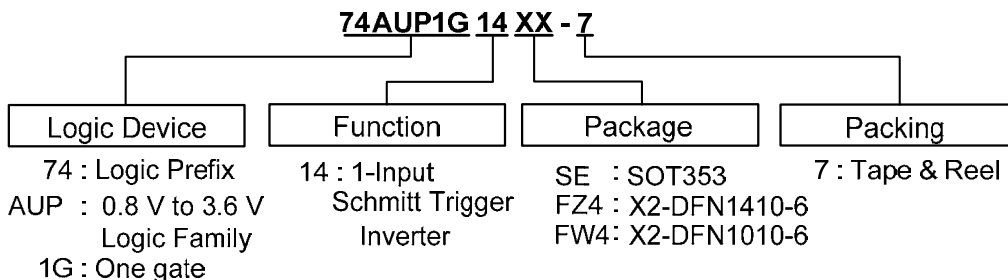
V <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>
	V <sub>i</sub>	t <sub>r</sub> /t <sub>f</sub>		
0.8V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
1.2V ± 0.1V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
1.5V ± 0.1V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
1.8V ± 0.15V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
2.5V ± 0.2V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
3.3V ± 0.3V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF



**Figure 1. Load Circuit and Voltage Waveforms**

Notes: A. Includes test lead and test apparatus capacitance.  
 B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.  
 C. Inputs are measured separately one transition per measurement.  
 D. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>PD</sub>.

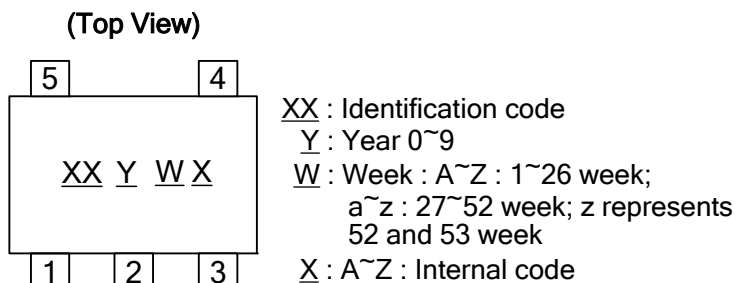
## Ordering Information



Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74AUP1G14SE-7	SE	SOT353	3000/Tape & Reel	-7
74AUP1G14FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7
74AUP1G14FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7

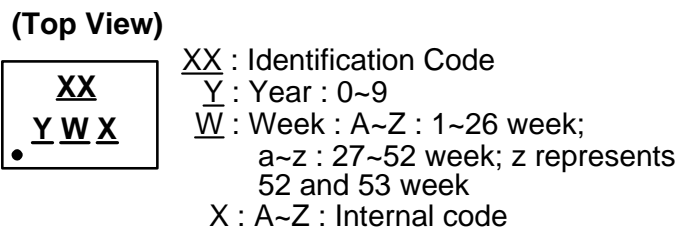
## Marking Information

(1) SOT353



Part Number	Package	Identification Code
74AUP1G14SE	SOT353	XS

(2) X2-DFN1410-6 and X2-DFN1010-6



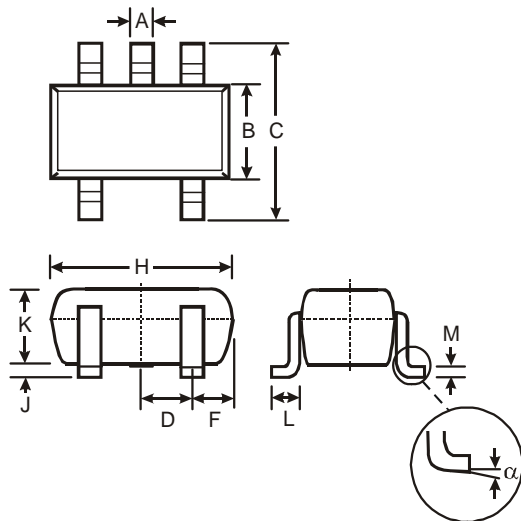
Part Number	Package	Identification Code
74AUP1G14FZ4	X2-DFN1410-6	XS
74AUP1G14FW4	X2-DFN1010-6	XS



**Package Outline Dimensions** (All dimensions in mm.)

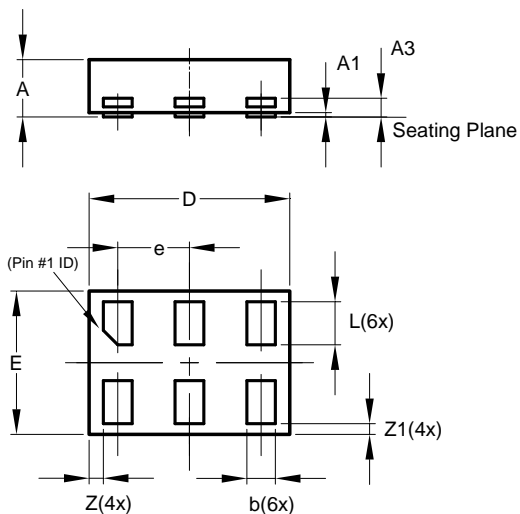
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**(1) SOT353**



SOT353			
Dim	Min	Max	Typ
A	0.10	0.30	0.25
B	1.15	1.35	1.30
C	2.00	2.20	2.10
D	0.65 Typ		
F	0.40	0.45	0.425
H	1.80	2.20	2.15
J	0	0.10	0.05
K	0.90	1.00	1.00
L	0.25	0.40	0.30
M	0.10	0.22	0.11
α	0°	8°	-
All Dimensions in mm			

**(2) X2-DFN1410-6**

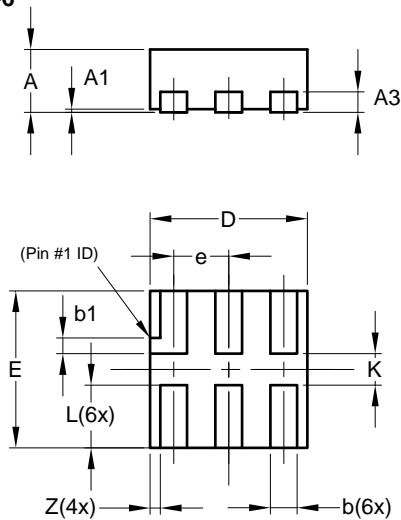


X2-DFN1410-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

**Package Outline Dimensions** (cont.) (All dimensions in mm.)

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**(3) X2-DFN1010-6**

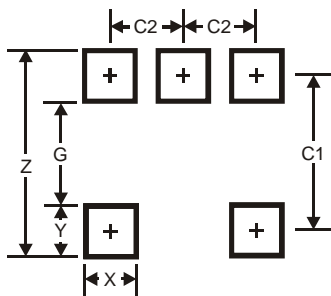


X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

**Suggested Pad Layout**

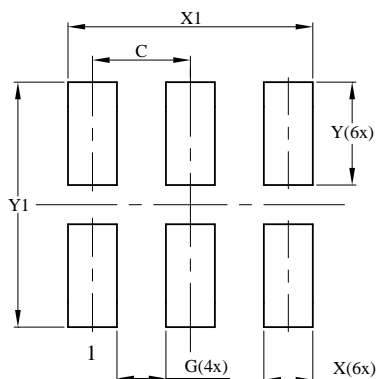
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version

**(1) SOT353**



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

**(2) X2-DFN1410-6**

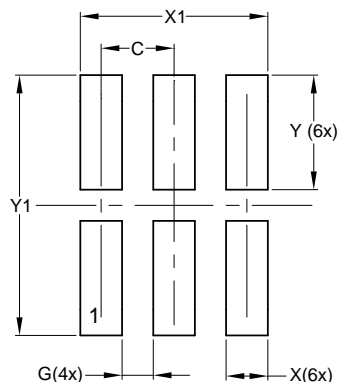


Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

## Suggested Pad Layout (cont.)

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### (3) X2-DFN1010-6



Dimensions	Value (in mm)
<b>C</b>	0.350
<b>G</b>	0.150
<b>X</b>	0.200
<b>X1</b>	0.900
<b>Y</b>	0.550
<b>Y1</b>	1.250

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